

What is claimed is:

- 1 1. An array substrate for use in a liquid crystal display device, comprising:
 - 2 a gate line arranged in a horizontal direction on a substrate;
 - 3 a data line arranged in a vertical direction perpendicular to the gate line over the
 - 4 substrate; and
 - 5 a thin film transistor formed near a crossing of the gate and data lines, the thin film
 - 6 transistor comprising:
 - 7 a gate electrode that is a portion of the gate line near said crossing, wherein the
 - 8 gate electrode has an opening portion in its central portion;
 - 9 a first insulation layer on the gate electrode;
 - 10 a semiconductor layer formed on the first insulation layer and over the gate
 - 11 electrode;
 - 12 a drain electrode formed on the semiconductor layer and over the gate
 - 13 electrode, the drain electrode corresponding to the opening of the gate electrode; and
 - 14 a source electrode extended from the data line and formed in a same plane as
 - 15 the drain electrode, the source electrode surrounding the drain electrode and opening of the
 - 16 gate electrode along steps of the semiconductor layer.
- 1 2. The array substrate according to claim 1, further comprising a second insulation layer
 - 2 formed over the thin film transistor, the second insulation layer having a drain contact hole
 - 3 that exposes a portion of the drain electrode.

1 3. The array substrate according to claim 2, further comprising a pixel electrode formed
2 in a pixel region that is defined by the gate and data lines, the pixel electrode contacting the
3 drain electrode through the drain contact hole.

1 4. The array substrate according to claim 1, wherein the opening of the gate electrode
2 has an inverted "T"-shape.

1 5. The array substrate according to claim 4, wherein the opening of the gate electrode
2 includes first and second opening portions.

1 6. The array substrate according to claim 5, wherein the first opening portion is formed
2 in a horizontal direction parallel with the gate line.

1 7. The array substrate according to claim 5, wherein the second opening portion is
2 formed in a vertical direction perpendicular to the first opening portion.

1 8. The array substrate according to claim 1, wherein the drain electrode has an inverted
2 "T'-shape.

1 9. The array substrate according to claim 8, wherein the drain electrode includes first
2 and second electrode portions.

1 10. The array substrate according to claim 9, wherein the first electrode portion is
2 arranged in a horizontal direction parallel with the gate line and corresponds to the first
3 opening portion of the gate electrode.

1 11. The array substrate according to claim 9, wherein the second electrode portion is
2 arranged in a vertical direction perpendicular to the first electrode portion and corresponds to
3 the second opening portion.

1 12. The array substrate according to claim 1, wherein the opening of the gate electrode is
2 shaped like a rectangle.

1 13. The array substrate according to claim 12, wherein the drain electrode has an inverted
2 "T"-shape and first and second electrode portions.

1 14. The array substrate according to claim 13, wherein edges of the first electrode portion
2 overlap the gate electrode.

1 15. The array substrate according to claim 14, wherein three side edges of the first
2 electrode portion overlap the gate electrode.

1 16. The array substrate according to claim 14, wherein two side edges of the first
2 electrode portion overlap the gate electrode.

1 17. A liquid crystal display (LCD) device, comprising:

2 a substrate;

3 a gate line on the substrate and extending along a first direction, the gate line having
4 an opening therein;

5 a first insulating layer on the gate line;

6 a semiconductor layer on the first insulating layer over at least a portion of the
7 opening;

8 a data line on the insulating layer and extending along a second direction substantially
9 perpendicular to the first direction;

10 a drain electrode on the semiconductor layer over at least a portion of the opening;

11 and

12 a source electrode on the semiconductor layer, extending from the data line and being
13 separated and spaced apart from the drain electrode.

1 18. The LCD device of claim 17, further comprising a second insulation layer over the
2 semiconductor layer and the source and drain electrodes, the second insulation layer having a
3 drain contact hole that exposes a portion of the drain electrode.

1 19. The LCD device to claim 18, further comprising a pixel electrode disposed in a pixel
2 region that is defined by an intersection of the gate and data lines, the pixel electrode
3 contacting the drain electrode through the drain contact hole.

1 20. The LCD device of claim 17, wherein the opening in the gate line has substantially a
2 "T" shape.

1 21. The LCD device of claim 17, wherein the source electrode substantially surrounds the
2 drain electrode.

1 22. The LCD device of claim 17, wherein the drain electrode has substantially a "T"
2 shape.

1 23. The LCD device of claim 17, wherein the drain electrode comprises:
2 a first portion which overlaps the opening; and
3 a second portion which overlaps the gate line on at least two opposing sides of the
4 opening.

1 24. A method of forming a liquid crystal display device, comprising:
2 forming a gate line on a substrate, the gate line extending along a first direction and
3 having an opening therein;
4 forming a first insulating layer on the gate line;
5 forming a semiconductor layer on the first insulating layer over at least a portion of
6 the opening;
7 forming a data line on the insulating layer extending along a second direction
8 substantially perpendicular to the first direction, a drain electrode on the semiconductor layer
9 over at least a portion of the opening and, and a source electrode on the semiconductor layer
10 extending from the data line and separated and spaced apart from the drain electrode.

1 25. The method of claim 24, further comprising forming a second insulation layer over
2 the semiconductor layer and the source and drain electrodes, the second insulation layer
3 having a drain contact hole that exposes a portion of the drain electrode.

1 26. The method of claim 25, further comprising forming a pixel electrode in a pixel
2 region that is defined by an intersection of the gate and data lines, the pixel electrode
3 contacting the drain electrode through the drain contact hole.

1 27. The method of claim 24, wherein the opening in the gate line is formed in
2 substantially a "T" shape.

1 28. The method of claim 24, wherein the source electrode is formed to substantially
2 surround the drain electrode.

1 29. The method of claim 24, wherein the drain electrode is formed in substantially a "T"
2 shape.

1 30. The method of claim 24, wherein forming the drain electrode comprises forming a
2 first portion which overlaps the opening and a second portion which overlaps the gate line on
3 at least two opposing sides of the opening.